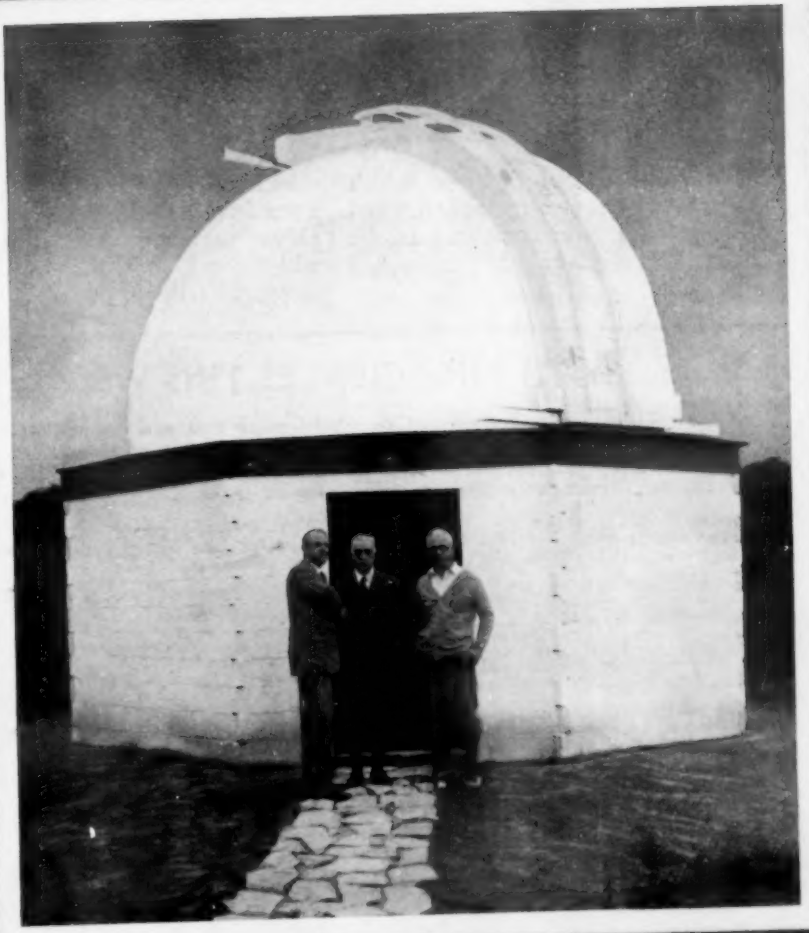
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



OCTOBER 22, 1932

Motion Picture Photographers of the Skies

See Page 258

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SCIENCE NEWS LETTER

VOL. XXII *No. 602*

The Weekly Summary of Current Science

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Edited by WATSON DAVIS

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? DO YOU KNOW THAT ?

The plant we call Jack-in-the-pulpit was named by the Iroquois Indians Baby-in-the-cradle.

Breeding grounds of the pink-footed goose are being sought in remote regions of Iceland.

The oldest tree in Scotland is said to be a yew tree in Glen Lyon, which has an estimated age of more than 2,500 years.

The U. S. Department of Agriculture says that both ripe and green olives contain abundant quantities of vitamin A.

A seventeenth century astronomer, who made the first map of the moon, named the mountain ranges after famous ranges on the earth.

The Pan-American highway, which will eventually stretch more than 9,800 miles, was this year completed in the Chilean sector, where 1,577 miles had to be built.

Tests by the U. S. Forest Service show that pound for pound burning pine wood gives off more heat than hickory.

New Zealand scientists lean to the view that New Zealand and Australia were never joined in the same land mass.

When heavy snowfall covers airports in mountainous central Idaho, a runway is made by compressing the snow with a roller.

A University of California expedition which collected mammals on St. Lawrence Island, Alaska, found five species: collared lemming, meadow vole, saddle-backed shrew, ground squirrel, and red-backed vole.

Perhaps the newest thing in service industries is "telephone answering"; a subscriber can go out to lunch or off to a conference, knowing that when his phone rings, the answering service will take the call and handle it for him in secretarial fashion.

WITH THE SCIENCES THIS WEEK

Curiosity arousing questions for the teacher and general reader. Book references in italic type are not sources of information of the articles, but are references for further reading. Books cited can be supplied by Librarian, Science Service, at publisher's price, prepaid in U. S.

ARCHAEOLOGY

For what purpose does Mrs. Nuttall think the four-corridored Monte Alban mound was used? p. 261.

What is the age of the oldest American house? p. 257. *Ancient Americans—Emily C. Davis—Holt*, 1931, $3.50.

ARCHAEOLOGY-ENGINEERING

Why will it be difficult to hold a protecting roof down over Casa Grande? p. 260.

ASTRONOMY-PHOTOGRAPHY

What kind of camera was used to take movies of the heavenly bodies? p. 258.

BOTANY

With what prized tropical furniture wood does the persimmon claim relationship? p. 266.

CHEMISTRY

What vitamin has the pecan been found a good source of? p. 260.

ENGINEERING

What generating capacity is concentrated at Niagara Falls? p. 261.

Where has a mountain-top drive been opened? p. 262.

Why were super-balloon tires put on tractors? p. 257.

ENTOMOLOGY

For what purpose are houseflies scientifically raised? p. 255.

INVENTION

How may electric lamps in series be made to signal the lamp causing failure? 261.

MEDICINE

What does a person on the Fort Benning Army post pay for a year's unlimited medical service? p. 261.

METEOROLOGY

Where is the farthest north Canadian Polar Year station? p. 262.

PALEONTOLOGY

How is the mastodon bone pit at Bayou Manchac being surveyed? p. 260.

What expedition obtained hitherto unknown Badlands fossils? p. 265.

What is a lemur? p. 256.

What is the weight of teeth of the largest woolly mammoth find yet discovered in the East? p. 255—*Paleontology—Edward Wilber Berry—McGraw-Hill*, 1929, $3.50.

PHYSICS

How many volt-electrons of energy can now be given hydrogen molecule ions? p. 256. *New Frontiers of Physics—Paul R. Heyl—Appleton*, 1930, $2.

PHYSIOLOGY

How long can an acclimated person exercise in rarefied atmosphere? p. 255. *The Respiratory Function of the Blood—Joseph Barcroft—Cambridge Univ. Press*, 1925, $5.

PSYCHOLOGY

Give six rules for success with political propaganda. p. 266.

PUBLIC HEALTH

How did discarded storage batteries cause lead poisoning? p. 256.

SEISMOLOGY

How many earth shocks were felt at Pasadena, California., during a recent period of little more than two days? p. 260.

STANDARDS-PSYCHOLOGY

How many automobile license plates are readable at the proper distance? p. 262.

PHYSIOLOGY

Different Breathing May Cause Scientists' Diverging Views

Those Who Hold Everest Cannot be Conquered Without Oxygen Said to Have Sea-level Respiratory Centers

THE CONQUEST of Mt. Everest, the world's highest mountain, altitude 29,141 feet, is a future feat which interests scientists greatly.

Physiologists are divided into two camps over the question of whether oxygen should be used to assist the climbers who attempt to scale this great height. Some, like Prof. J. Barcroft of Cambridge University, contend that the climbing of Everest is now merely an engineer's problem, that of designing a light and efficient oxygen breathing apparatus. Others, particularly Dr. J. S. Haldane of Oxford, feel strongly that the attack on the mountain can be made without the aid of oxygen and that the mountaineers can become acclimated to the rarefied air.

That this disagreement arises not so much because these British scientists think differently but because they breathe differently, is contended by Prof. Yandell Henderson, the Yale physiologist and authority on respiration.

There are two types of men, those who acclimatize slowly and with difficulty and those who readily become adjusted to low pressure of oxygen.

The first type suffer from prolonged mountain sickness and it is they who earnestly advocate the use of oxygen. They have what Prof. Henderson calls "sea-level respiratory centers." For them oxygen is the breath of life. They are the ones who should fly direct and wholly unacclimatized to the North Col of Mt. Everest, don an improved oxygen apparatus, make the ascent and get back below 15,000 feet while the supply of oxygen holds out. For them the ascent is an engineering problem.

But the other sort of person becomes so well adjusted during the slow ascent through Tibet to the starting place of the real climb, that Prof. Henderson believes a party of such persons might reach the summit without oxygen apparatus. The feat would be difficult and the risk great, but it would be safer without oxygen apparatus for this type of mountaineer.

The serious disadvantage in wearing an oxygen apparatus after acclimatization at a great height is due to the physiological fact that the blood alkali is reduced in proportion to the altitude and oxygen pressure. As the ratio between the blood acid and alkali must be kept balanced at high altitudes as at sea level, breathing must be speeded up at great heights in order to remove the blood's acid in the form of exhaled carbon dioxide. Prof. Henderson finds that a man adjusted to sea level breathes at rest 5 to 7 liters (quarts) of air per minute and when exercising 40 to 60 liters per minute. At the altitude of the North Col of Mt. Everest, an acclimatized person breathes 10 to 14 liters at rest, and 80 to 120 liters when exercising. Exhaling and inhaling 80 to 120 liters of air a minute is intolerable for more than a minute or two, and a man can not walk while breathing at this rate.

Donning an oxygen apparatus after becoming adjusted to rare air does not make the heavy work of climbing easier, for the increased amount of carbon dioxide produced induces so large a volume of breathing that the climber can take only a few steps at a time.

Science News Letter, October 22, 1932

ENTOMOLOGY

Raising Houseflies Now a Business

HOUSEFLIES, usually regarded as pests to be swatted or sprayed out of existence as quickly as possible, are purposely raised in large numbers, and improvements in the technique of their rearing are matters of real scientific and commercial concern. Flies are desired by manufacturers of fly-killing sprays, who test the deadliness of their products on them.

Henry H. Richardson of the U. S. Department of Agriculture has developed a medium for feeding the young or larval stage of flies, which is stated to be an improvement over the hitherto universally employed stable waste. The latter is disagreeable to handle, sometimes unobtainable, and often harbors parasitic red mites which attack flies and render them unsuitable for experimental purposes. Mr. Richardson's medium consists of wheat bran, alfalfa meal, water, yeast and diamalt, a commercial product containing a large percentage of malt sugar.

The research on the new fly-raising food was conducted by Iowa State College at Ames, as a Crop Protection Institute project, backed by funds from a prominent oil refining company. Mr. Richardson's description of his medium is published in *Science*.

Science News Letter, October 22, 1932

PALEONTOLOGY

Important Mammoth Find Uncovered on Golf Course

FIVE TEETH and several bone fragments of the woolly mammoth, the largest single find of this huge Ice-Age mammal ever made in the East, have been discovered on a golf course near Philadelphia, and were placed on display at the Academy of Natural Sciences in Philadelphia.

The fossils were found by a workman during the course of steam shovel excavation for a new water hazard. They were buried four feet under ground. The teeth weigh from three and a quarter to six and (*Turn Page*)

FIVE ENORMOUS TEETH

These teeth of the Woolly Mammoth, with several bone fragments, constitute the largest find of Mammoth remains yet made in the East. The huge curved tusk was already in the Museum of the Philadelphia Academy of Natural Sciences. The model shows how the animal appeared in life.

three-quarters pounds each, and are in a good state of preservation.

Edgar B. Howard, of the Academy's museum, identified the specimens as belonging to *Elephas primigenius,* one of three species of genuine elephants that roamed North America during and immediately after the Pleistocene, or glacial period. Although this species was the smallest of the three, it was still huge, the beasts averaging nearly ten feet high at the shoulders, with tremendous curving tusks bigger than those of any living elephant. It was protected against the cold by a thick coat of wool, overhung with long hair.

When this great animal lived in North America, its kindred were hunted by cave men in Europe, who also drew and sculptured their likenesses on the walls of their caverns and on ivory of their own tusks. Whether such hunters existed also on this continent has not yet been definitely determined.

Science News Letter, October 22, 1932

PALEONTOLOGY

Monkey-Like Animal Found In German Lignite Mine

THE SKELETON of an exceedingly primitive lemur, a lower form of monkey-like animal, has been found in one of the great lignite or brown-coal mines in the valley of the Geisel, by Prof. Johannes Weigelt of the University of Halle. It is quite small, its length without the tail being only about four centimeters (1 3-4 inches), of which one-third is skull. The structure of the animal, especially of its skull, offers support for the theory of Prof. William K. Gregory of the American Museum of Natural History, that all ape-like animals evolved from tree-shrews. Because the mine in which it was found bears the name "Cecilie," Prof. Weigelt has named his new genus *Ceciliolemur dela saucei.*

The skeleton was found in one of two great masses of animal bones, which probably represent deep places in some long-lost stream bed. Into these the bodies of drowned animals sank, and in them water animals like crocodiles, perishing of summer drought, found their last refuges. The deposits are of middle eocene age, dating back approximately fifty million years.

Prof. Weigelt has reported the details of his find to the German scientific journal *Forschungen und Fortschritte.*

Science News Letter, October 22, 1932

PHYSICS

Super-Atomic Bullets Smash Lithium Atoms for Americans

California Physicists Confirm Work of British With New Machine That Promises to Blast Atoms of Any Element

USING ATOMIC BULLETS speeding with the energy of over 700,000 electron-volts, Prof. E. O. Lawrence of the University of California and his associates have succeeded in smashing the lithium atom into two alpha particles or ionized atoms of helium gas.

Prof. Lawrence thus confirms work done by British physicists who used lower energy protons as the bombarding projectiles. They found that protons shot at the lithium atoms combined with them and released energy.

A special apparatus that imparts high energies to atomic particles by whirling them in a magnetic field was used by the University of California investigators.

With this machine, designed by Prof. Lawrence and Dr. M. Stanley Livingston, serving as a source of proton bullets or hydrogen atom nuclei endowed with high energies, the physicists bombarded a crystal of lithium fluoride with a stream of some ten billion of these subatomic bullets per second.

In the first test proton bullets with energies of 360,000 volt-electrons were used. Then the energy of these tiny projectiles was raised to 510,000 volt-electrons, and finally to 710,000 volt-electrons. In each case the number of lithium atoms disintegrating under the bombardment was obtained by counting the helium ions which shot out of the crystal. The number of disintegrating atoms increased as the energy of the proton bullets was increased.

With the equipment now on hand, Prof. Lawrence and his associates, Dr. Livingston and Milton G. White, believe they are in a position to carry these disintegration experiments to a further point than has yet been possible. The machine now in use is capable of producing protons with energies as high as 1,200,000 volt-electrons. Although this is a higher limit of energy than has ever been officially reported, Prof. Lawrence says that he has a larger machine of the same type which will record a still higher limit of energy. This machine, which contains one of the world's largest magnets, is now producing hydrogen molecule ions with an energy of 3,600,000 volt-electrons.

The highest energies previously reported were those obtained in the department of terrestrial magnetism of the Carnegie Institute of Washington. The limit was about 1,000,000 volt-electrons, and the number of protons with this energy was very small. In comparison, the University of California machines produce projectiles at the rate of about ten billion per second, and reach energies well over one million volt-electrons.

With such means available it is believed that it will be possible to blast apart any atom in the table of chemical elements. This will in effect open a new field of physics, and far-reaching discoveries may be anticipated in the future.

Science News Letter, October 22, 1932

PUBLIC HEALTH

Discarded Batteries Caused Lead Poisoning Outbreak

DISCARDED casings of storage batteries now appear as a new source of lead poisoning. Thirty-six cases of poisoning from this cause were reported to the City Health Department of Baltimore. The casings had been given away by junk dealers of the city to be used as fuel after the lead plates had been salvaged from them. Lead, which is usually deposited in the form of lead sulfate, vaporized into poisonous fumes when the casings were burned.

The victims were all children, with the exception of one woman, mother of one of the children. All the patients were Negroes and, with three or four exceptions, all lived in the same neighborhood. Apparently they had all obtained the battery casings from the same dealer.

The Baltimore Health Department has warned junk dealers that the

tery casings are a source of danger and must not be distributed for use as fuel. Discovery of the cause of the outbreak, which occurred within a two-week period, was made by Dr. Wilmer H. Schulze of the Baltimore City Health Department. The outbreak was reported to the health department by Drs. Miriam Brailey and H. B. Rothschild of the children's department of the Johns Hopkins Hospital and by Dr. Frank R. Smith, Jr., of the Provident Hospital.

Science News Letter, October 22, 1932

ENGINEERING

Huge Airplane Tires Used on Tractors

ROUGH-RIDING, steel-wheeled tractors are being tamed into smooth-going, comfortable mounts by super-balloon tires.

This is one of the latest applications of pneumatic tires and was described by Burgess Darrow of the Goodyear Tire and Rubber Company at the meeting of the Society of Automotive Engineers in Toronto. Mr. Darrow called it a startling development, because the full airwheel, practically the same tire developed for airplanes with the addition of a non-skid tread, is used. They are 20 inches wide and are inflated at from three to five pounds pressure.

"The demand came first from the orange groves of Florida where sand hindered the usual operation and steel tires sometimes damaged tree roots," Mr. Darrow stated. "The drawbar pull that can be exerted by the tractor with such tires is astonishing; in most cases it exceeds that with the steel tires."

Science News Letter, October 22, 1932

AIRWHEELED STEEL MULE

ARCHAEOLOGY

"Oldest American House" Dated by Tree Calendar

Annual Rings in Corner Post Give 784 A. D. as Date Of Cutting Timbers for Pueblo Pit House in Arizona

THE "OLDEST" houses built by the white invaders of the present United States which are historical exhibits at such places at Sante Fe, N. M., and St. Augustine, Fla., become veritably modern when compared with dwellings of the Indians who lived centuries ago in the American Southwest.

Archaeologists can now confer with some assurance the title of "oldest dated house in the United States." Like many records, the title has changed hands frequently since research made a decision possible.

Less than three years ago, this new sort of rivalry for antiquity began, when Dr. A. E. Douglass of the University of Arizona announced the completion of tree-ring research making it possible to find out the exact age of old Indian habitations in the Southwest. Since that announcement, the dating of prehistoric pueblos and cliff dwellings has gone busily on. The interest that attaches to the "oldest" dated house in this country has shifted from place to place as new dates are authenticated.

Dr. Douglass' method of making prehistoric, abandoned ruins of houses reveal their precise age is so ingenious that it has attracted wide interest. The device is a calendar formed of the annual growth rings of trees.

The calendar's success hinges on the fact that tree rings are not alike. In 1930, for example, growing trees in many parts of the United States received very little rain. As a result, the ring added to the girth of one of those trees was conspicuously narrow and meager. Thus each calendar year sets its characteristic stamp on the wood, and a series of unusually dry or rainy years forms a pattern of tree rings which is not likely to be repeated.

Using the unusual sequences of years as guides, Dr. Douglass matched tree rings on older and older cross-sections of timber. In 1929 he had a complete tree ring calendar, with rings matched to calendar dates from 700 A. D. on.

When the calendar was complete, the ages of some forty Southwestern settlements were at once revealed. Oldest of them all was Pueblo Bonito, which contained a beam of timber cut and used in house-building in the year 919 A. D.

Pueblo Bonito's record stood unchallenged until a few months ago. Then an Indian settlement two miles away proved its priority. In this ruin known as Una Vida a beam was dated 861 A. D.

This record stood a short time, and then gave place to an Arizona record. A pueblo near Allentown, Arizona, was being excavated, and four timbers were found in the floor of a house. The wood was cut by the builders in the year 797.

Now comes a new announcement, and a new "oldest dated house in the United States." The Museum of Northern Arizona has excavated a burned Pueblo pit house, which was occupied for about a hundred years, back in the prehistoric times. The Indians who built it unwittingly established a cornerstone just as authentic as any tablet of chiseled stone. The corner posts of the house were the "official records." One of these has been examined for its date in the tree ring code, and the reading gives a new depth to United States "history"—784 A. D.

Science News Letter, October 22, 1932

ASTRONOMY-PHOTOGRAPHY

Sun, Moon and Stars In The Movies

The Spare-Time Hobby of Two Engineers and a Judge Reduces a Month on the Moon to 15 Minutes on the Screen

By DR. FRANK THONE

See Front Cover

JOSHUA, it is recorded, commanded the sun and the moon to stand still and they obeyed him.

In this modern Yankee land and age of hustle, we are much less interested in making things stand still than in making them move faster. Present-day Joshuas would be more likely to command the sun and the moon to "get a move on!"

Indeed, this has already been accomplished in effect, by a remarkable combination of telescope and movie camera, which obtains films of sun and moon, planets and stars, going through days or months of slow celestial changes condensed into minutes of projection time. A month on the moon boils down into a quarter of an hour on the screen. It beats hollow the classic preference of Tennyson:

"Better twenty years of Europe than a cycle of Cathay."

The place where this feat has been accomplished is, appropriately enough, near Detroit, the city where speed is incorporated into machines and shipped on wheels all over the world. The Joshuas who have turned the trick are three: Robert McMath, Francis C. McMath and Henry S. Hulbert. By day, the McMaths are engineers and financiers and Mr. Hulbert is a judge. But by night they are all astronomers—pioneer adventurers into an entirely new field of the oldest of the sciences.

Although the men are professed amateurs, the solidity of their accomplishment is witnessed by the fact that the University of Michigan has added their observatory to its formal astronomical equipment, and has made them honorary members of the faculty. The university has, indeed, adopted them bodily, for they deeded over their specially built and splendidly equipped observatory and at the same time dedicated their tireless hours of scientific labor as part of the university's astronomical program.

Nor is this recognition given for technical accomplishment that is of interest and benefit only to cloistered scholars out of touch with everyday life. Quite the contrary. The movies of the skies which the McMaths and Judge Hulbert have made and are still making are of interest to astronomers, to be sure—the American Philosophical Society, oldest scientific association in the United States, applauded when they were shown before them—but they can be understood and appreciated by anybody and everybody, and will be of much use in the instruction of budding young astronomers in high schools and freshman college classes.

The Time-Shortening Machine

One real trouble with astronomy is that it moves so slowly—a disadvantage it shares with botany and geology. The amateur or student interested in animals sees something moving all the time, but though the sun and moon and planets change their relative positions in fascinating fashion, they move so slowly that it takes days at least, and sometimes months, to see them through to the end. Most of us are too impatient to come back night after night just to see a planet inch its way along among the stars.

This is where the McMath-Hulbert films come to the rescue. The audience can see the month-long day of the moon express itself in lengthening shadows of the moon mountains across the empty lunar seas. It can see the birth, progress and disappearance of sunspots. It can follow the waxing and waning of Venus, which passes through phases like the moon—something first seen by Galileo through his crude telescope generations ago. It can watch Jupiter spinning on its axis, while its family of moons dance around it. It can see all this in a single evening of fascinating scientific entertainment. Or, if it is a school audience, it can see these things an appropriate points in its course, without waiting for a time when the weather is favorable and then sitting up all night for just a fragment of what these remarkable films can show.

It is all done by a reversal of the technique that gives us the familiar slow-motion pictures of the newsreels. In these, the films are taken at a furious speed, and projected at the ordinary rate of sixteen a second. In the McMath-Hulbert films, the pictures are taken slowly, minutes or even hours apart, and then projected at the conventional rate. This makes the changes run through their course with as much of an acceleration effect as the common slow-motion film shows of retardation. Such speeded-up pictures have been shown to a certain extent already, with growing plants and similar slow-changing things as subjects.

It all sounds very simple: just point your camera and crank slowly enough. If that were all! Even with plants that stand still in front of the lens and don't require the help of a high-power telescope the job has its difficulties, as any of the growth-recording scientific camera-men can tell you. But astronomical changes are never even as nearly uniform as growth in a plant, and the celestial objects do anything but stand still. The rotation of the earth sweeps them across the sky from east to west; the change of the seasons moves them (at a slower rate) from north to south and back again; the refraction effect of the earth's atmosphere makes them seem to travel at different rates of speed as they leave or approach the horizon; the planets' revolution about the sun causes them to move sometimes faster, sometimes slower, than the "fixed" stars; and the moon's behavior is a very devil's puzzle to unravel. And all these possibilities of error, which would make the pictures dance and wobble beyond toleration, are increased scores of times by the necessity of using a high-power telescope, which magnifies everything that happens with the large impartiality of the rain which falleth alike on the just and on the unjust.

Astronomers as Gun-Pointers

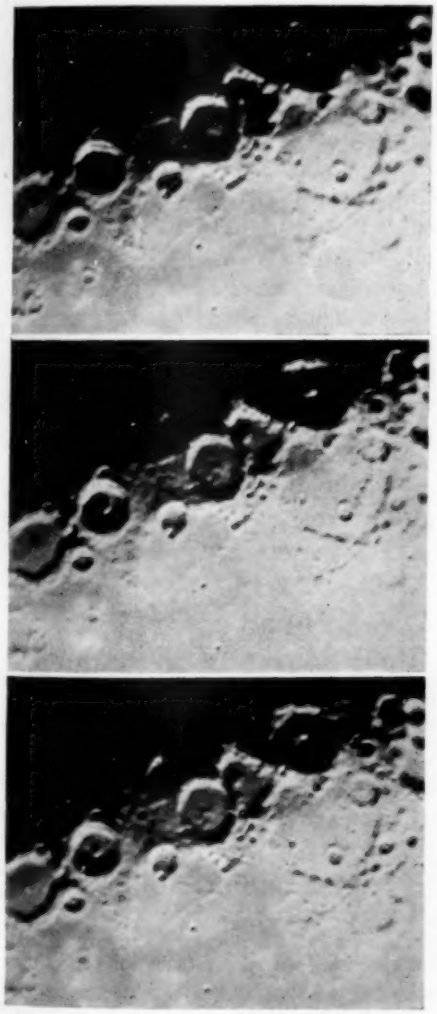
These problems have already had to be met by photographic astronomers who for years have been making "stills" of various heavenly objects. All large telescopes are equipped with mecha-

FRONT COVER ILLUSTRATION

Judge Henry S. Hulbert, Francis G. McMath and Robert R. McMath in front of their observatory at Detroit, of which Robert McMath is director.

isms to compensate for all these error-introducing motions of the earth beneath and the heavens above: besides which an astronomer must always sit behind the big 'scope, his eye glued to the eyepiece of a smaller telescope mounted upon it, keeping the cross-hairs of the objective trained on the target exactly as a gunner on a battleship keeps his piece pointed during every moment of an action.

So the usual guiding mechanisms, both automatic and manual, were used in the reflecting telescope installed by the three men in their observatory at Lake Angelus, with certain modifications to fit them for their job of making motion pictures of the heavens, rather than "stills." For one thing, it would not be necessary for the telescope to be held steady for hours, as is sometimes the case when a "still" of a distant nebula or other very faint object is in the making. The program called for work with comparatively bright things, with exposure times usually of minutes only.



NIGHT FALLS ON THE MOON

Notice the lengthening shadows in the craters as the eye travels up this row of pictures. They were enlarged from a McMath-Hulbert "moon movie."

Keeping the Stars from Dancing

On the other hand, however, there was the inexorable necessity for getting the next exposure into the "frame" at exactly the same spot as its predecessor. If this were not done, the picture would dance on the film, to its ruination.

That problem disposed of, the three sky-impresarios tackled the matter of a camera. This proved to be the simplest part of the job. They took over a standard commercial portable machine bodily. The film mechanism was all right "as was"; all they had to do was take out the driving spring and the rest of the cranking parts and slip it into a special carrier they rigged for it at the eye end of their telescope.

Then came the matter of timing for the exposures, and the development of a special mechanism that would take care of this most important detail unfailingly, automatically and accurately. It had to be adjustable to even more changes than the driving mechanism of the telescope had to take care of. The same camera exposures had to be timed for the brightness of the sun and the dimness of a distant variable star, with all degrees of illumination in between. It had to be able to "stop" the rapid rotation of Jupiter and the relatively fast backward "drift" of the moon across the sky. It had to be adjustable to such time combinations as, "open nine minutes, shut one minute."

There was a deal of hard thinking and wearisome mathematics went into the solution of this problem. In the end, the three astronomers, backed by their mechanical ingenuity and skill, evolved a gear train, similar to the transmission of an automobile but naturally more complicated, connected to the shutter mechanism of the camera with a flexible shaft. The gears were not especially cut, but were selected out of catalogs of standard machine equipment. Where a particular problem called for interrupted action every so often, they cut off one or more of the teeth of the gear to be used. These gears are interchangeable, and one can be taken out and another substituted in a few seconds.

In addition to the variable speeds obtainable with the gear train further flexibility in exposure times can be obtained by varying the speed of the motor that drives it. This is kept at a uniform basic speed through the telechron timing of the city current used, but the three astronomers have introduced circuit variations that make corrections if any vagaries occur, and also enable them to change the speed, though still holding it in uniform relationship to the telechron current. Motors with similarly controlled speeds are used in the pointing mechanism of the telescope itself, and the whole system is kept at the bidding of the operator by a switchboard of push-buttons at his hand. There is even a button to raise or lower the chair in which he sits at the eye end of the telescope.

Patience in the Cold

Even with all this ingenuity, the filming of heavenly bodies is still not an easy task. All sorts of troubles have to be met with patience. The stars whom these astronomical movie men "put into the pictures" perform on their own time, not at the command of any director, and they have to be ready to photograph them just at those moments. Often a part of a film can be made in one night, and then a wait of days or weeks must intervene before the subject is again in position to allow a continuance. So a completed film showing connected action may be as much of a patchwork as any Hollywood "continuity." And this does not take into account the vagaries of the weather, which may shove an obscuring cloud across the heavens just when a moment arrives which they have awaited for months and which will not come again for months more. Nor does it take account of the physical discomfort of night work in an observatory open to a mid-January sky—for astronomical observatories can never be heated.

But the two McMaths and Judge Hulbert make nothing of this. If clouds come they wait philosophically for a clear night later on. If it gets too cold, they put on aviation suits. And they keep steadily at their fascinating avocation of capturing the distant creatures of the heavens and training them to trot or gallop as they will, and as the interests of astronomy may be best served.

ARCHAEOLOGY-ENGINEERING

Adobe House Gets Steel And Concrete "Umbrella"

CONSTRUCTION work has been started on a steel and concrete "umbrella," to protect the famous adobe Indian ruins of Casa Grande, the "Big House," near Coolidge, Arizona.

"This is the first time the National Park Service has attempted to protect a prehistoric pueblo ruin by building a modern steel and concrete structure over it," Robert H. Rose, Park Naturalist of the Southwestern Monuments, stated to Science Service.

"The task is unusually difficult, since every precaution must be taken to prevent damage to the prehistoric ruins.

"The ruins are the remains of a building constructed by prehistoric Indians probably 700 to 800 years ago, and abandoned 500 to 550 years ago. Any damage that might be done to the walls by dropping one of the immense steel trusses could never be repaired without permanent injury to the value of the structure as a relic of Upper Stone Age architectual achievement."

Some engineering problems of constructing the new shelter are unique, Mr. Rose stated. In most structures, footings and columns are designated primarily to hold the structure up. At Casa Grande, the big problem is to hold the structure down against the enormous lifting force created by a vertically upward wind velocity of 34 miles an hour.

Science News Letter, October 22, 1932

PHYSICS

Solid Structure Discussed At Soviet Conference

EMINENT scientists from many countries recently met in Leningrad with Soviet scientists to discuss the latest theories devised to explain the structure of solid bodies.

Prof. P. A. M. Dirac of Cambridge, England, pioneer in the quantum theory, joined in the discussion of his own electrodynamic theory and the conference devoted to nuclear phenomena, especially the analysis of atomic structure in terms of protons and neutrons, and the repercussion of those phenomena upon the law of conservation of energy.

The unexplained behavior of the energy distribution in the beta ray emission of radioactive bodies did not appear to shake the confidence of the scientists in the utility of the postulate of the conservation of energy when applied to subatomic phenomena. Prof. R. Fowler of Cambridge, England, Prof. E. Tamm of Moscow, Prof. J. Frenkel of Leningrad and others participated.

Prof. W. L. Bragg of the University of Manchester, England, reported that it is now possible to use X-rays to determine the structure of complicated compounds like the silicates that build rocks. X-ray analysis heretofore has shown the structure of simple compounds and crystals.

That the more perfect a crystal is the less resistance it offers to distortion was the curious fact pointed out by Prof. A. F. Joffe of Leningrad.

Prof. J. Frenkel of Leningrad analysed the concepts "solid" and "liquid" and observed that many properties which used to be considered characteristic of solids are shared to some extent by liquids, and vice versa. Liquids, for instance, have a measurable rigidity under high frequency mechanical vibration.

Science News Letter, October 22, 1932

PALEONTOLOGY

Extent of Mastodon Bone Pit Sought

BY MEANS of bore holes, a test is being made to show the extent and position of mastodon remains in the great bone pit along the bank of Bayou Manchac, Dr. H. V. Howe, director of the school of Geology at the University of Louisiana, has informed Science Service.

Bones and teeth of several well preserved mastodons, found in the bone bed, have led to an intensive investigation of the site. Wide extent of the ancient bone deposits is indicated by exposed bones found for a hundred feet along the bank of the bayou which is a mile west of Hope Villa. The bones lay in marl rich in clams, snails, fish, and ostracods.

The mastodon bones are scientifically important, Dr. Howe explains, due to their location in the youngest coastal terrace and their possible association with an old lake fauna.

Evacuation of the deposits will require considerable time because of the heavy load of sediment lying above the mastodon layer.

No evidence of man has so far appeared in the layer of earth that represents the mastodon age.

Science News Letter, October 22, 1932

IN SCIE

SEISMOLOGY

Series of Earthquake Shocks Felt in California Region

EIGHTEEN small earthquake shocks from a source about 200 miles from Pasadena, Calif., were registered at the Seismological Laboratory between Friday, Oct. 7, at 11:47 p. m. and Monday, Oct. 10, at 7 a. m. Pacific standard time. H. O. Wood, in charge of the observatory, estimated that five of the shocks were possibly strong enough to cause slight damage near their origin but that they were probably not centered near any town. Brawley, Calif., in the Imperial Valley, reported shocks felt locally.

The tip of the peninsula of Lower California was shaken by an earthquake on Tuesday afternoon, Oct. 11. On July 12, three months previously, the same region felt a similar shake. The last earthquake was located by scientists of the U. S. Coast and Geodetic Survey, using data collected from five seismological stations by Science Service. They gave the epicenter as in latitude 24 degrees north, longitude 110 degrees west, and the time of origin as 2:08.2 p. m., eastern standard time.

Science News Letter, October 22, 1932

CHEMISTRY

Pecan Found to Be Good Source of Vitamin A

WHEN YOU MUNCH salted pecan nuts at a dinner party, you are not only enjoying a tasty tidbit but getting a considerable amount of vitamin A tucked into your system, it appears from recent studies of Harold Levine of the South Carolina Food Research Commission. Feeding experiments with pied rats showed that the delectable pecan is a good source of vitamin A, which prevents infections, promotes growth and appetite and maintains health and vigor, he reported to the *Journal of Home Economics*.

Science News Letter, October 22, 1932

E FIELDS

BACTERIOLOGY

Bacteria in Oil May Aid Oil-Dwelling Insects

BACTERIA that appear to be able to get a living out of crude-oil are being studied by Dr. W. H. Thorpe of the University of Cambridge. Similar bacteria are found in large numbers in the digestive system of a strange insect whose larval stage is found in oil pools, and it may be that the bacteria predigest some fraction of the oil, making it available for the insects' nutrition. This is one of the points which Dr. Thorpe is endeavoring to determine.

Dr. Thorpe reported the progress of his experiments to *Nature*.

Science News Letter, October 22, 1932

ARCHAEOLOGY

Monte Alban Ruin Called America's Most Important

MONTE ALBAN, which gained wide fame last spring when a treasure tomb was opened there, has new distinction conferred upon it. A neglected mound at Monte Alban is now pronounced America's most important ruin, by Mrs. Zelia Nuttall, well-known authority on Mexican archaeology.

The mound in question contains an interior rotunda with an opening in the ceiling. Four corridors lead out in the cardinal directions. Mrs. Nuttall concludes that the structure was used by prehistoric Mexican Indians for astronomical purposes.

Mayan Indians of Yucatan, who were learned in astronomy, built curious underground structures called "chultunes." These are shaped like a long-necked decanter with a circular opening at the top. Mrs. Nuttall has long held the view that astronomer-priests of the Mayas descended into these dark "bottles" and there in secret watched for the time when the sun's rays would enter the vertical shaft and fall on the center of the floor. That was the signal that the sun had passed through the zenith, and the priests came out to tell the people that they could sow their corn and other food crops, for the season of rainfall was approaching.

The Monte Alban astronomical observatory is superior to the Mayan chultunes, Mrs. Nuttall finds. The presence of this type of building in Oaxaca, Mexico, proves that there was intellectual unity among the ancient cultures of tropical America, she points out.

Although Monte Alban is known as an old Zapotec fortress-city, the builders of the observatory, unknown to modern science, are believed not to have been Zapotec Indians.

Science News Letter, October 22, 1932

MEDICINE

Army Post Reduces Cost of Medical Care

THE CIVILIAN population can take a lesson from the U. S. Army post at Fort Benning, Georgia, on how to cut down the costs of medical care, it appears from a study of the situation there made by Dr. I. S. Falk. Dr. Falk's report was announced by the Committee on the Costs of Medical Care.

The cost for each person for the practically unlimited medical service available at Fort Benning is $40.90 per year, Dr. Falk computed. Certain procedures could be eliminated in adopting the system to civilian life, which would reduce the per capita cost to about $35 or even $30 per year. The average cost for a maternity case cared for at Fort Benning hospital was $129.24. Elsewhere this would have been $246.17 for families whose total medical costs were similar to those of the Fort Benning group.

Dr. Falk attributed the lower costs for medical, nursing, dental and hospital services to organization and efficient utilization of resources, reducing to a minimum wastes arising from lack of coordination, emphasizing preventive measures, and reducing "many useless and unwise expenditures common in the spending habits of people who purchase their medical care from uncoordinated agencies."

Nearly 8,000 persons at Fort Benning were eligible to receive care under the post's organized medical service in 1930, the year studied. Almost half of this number consisted of family groups —military heads of families and their dependents and servants—comparable to any normal civilian population.

Science News Letter, October 22, 1932

ENGINEERING

Niagara Still Greatest Power Generation Center

THE COMPLETION of the huge Dneprostroy power project in the U.S.S.R. calls attention to the fact that, although this plant will have the largest installed capacity under one roof, the greatest concentration of generating equipment is at Niagara Falls.

When all its power units are installed, Dneprostroy will have a normal generating capacity of 756,000 horsepower. The combined ratings of generators that obtain power from the falls at Niagara and are housed in separate plants total 1,605,850 horsepower. The largest capacity under one roof is 562,000 horsepower in the Queenston-Chippewa plant of the Hydro Electric Power Commission of Ontario, and the next largest is 452,000 horsepower in the Schoellkopf plant of the Niagara Falls Power Company. The capacity at Niagara Falls was erroneously given in an article in the SCIENCE NEWS LETTER for August 27, page 137.

A more complete index of the value of a plant than installed capacity, is annual output of electricity. Engineers of the Soviet plant expect the annual output to be about three billion kilowatt hours. In contrast with this figure is 7,400,000,000 kilowatt hours that is actually obtained from Niagara Falls each year by the different plants. Dneprostroy is planned to be Europe's largest electro-chemical center.

Science News Letter, October 22, 1932

INVENTION

Neon in Electric Lamps Signals Which Bulb Fails

NEON, the rare gas that fills the reddish electric advertising tubes, is now used to tell when a Christmas tree bulb burns out. Eight 15 volt lamps are burned in a series on a Christmas tree string and when one lamp burns out all are extinguished.

An ordinary vacuum lamp when burned out must be discovered by trial, but when the lamps are filled with neon instead the current passing through makes this gas glow with its characteristic red when the filament is broken. Not enough current is let through to light the other lamps and the bulb with a glow is the one to be replaced.

Science News Letter, October 22, 1932

METEOROLOGY

Canadian Scientists Attack Unknowns of Arctic Frontier

CANADA has launched a strong offensive against the unknowns of her great northern frontier.

The Canadian Meteorological Service, directing activities of the Polar Year 1932-33 in this country for the International Commission, has sent three new parties of scientists in the field to pioneer along a northerly front of about 2000 miles and has reinforced a fourth permanent station farther to the south. Their activities are closely tied in with those of French and Danish scientists in Greenland and Americans in Alaska.

The most northerly point, Coppermine on Coronation Gulf of the Arctic Ocean, has been occupied by R. C. Jacobsen of the University of Toronto and two radio operators. They are well located to observe the inflow of air from the Arctic which affects the climate of practically all North America. This is the most westerly of the three far-north stations.

The principal station of the three is at Chesterfield Inlet on the northwest shore of Hudson Bay. It is manned by the largest party under the direction of F. T. Davies, former magnetician of the Byrd Antarctic Expedition. The Chesterfield Inlet post, 475 miles from the north magnetic pole, is the nearest point to the pole at which continuous magnetic records will be taken during the Polar Year. As a part of their work, scientists at this station also expect to measure the height of the aurora by photographing the phenomenon simultaneously from Chesterfield Inlet and from a location 20 miles distant.

Prof. Arthur H. Compton of the University of Chicago, Nobel Prize physicist, joined this party for a brief period with his cosmic ray apparatus. He left this equipment to be operated by the staff of the station.

Another temporary observatory has been set up by J. E. Lilly of Acadia University at Cape Hope's Advance on the southern shore of Hudson Strait midway between Hudson Bay and the Atlantic Ocean. His work includes complete surface, meteorological and upper air observations.

In addition to these far northern observing points which the Canadians have equipped for the International Polar Year ending Aug. 31, 1933, activity of the permanent magnetic observatory at Meanook, Alberta, has been increased.

British scientists are also reinforcing the work of the Canadians. They have reestablished a station at Fort Rae, about 400 miles south of Coppermine, which they occupied jointly with Canadians during the first International Polar Year 50 years ago.

Science News Letter, October 22, 1932

ENGINEERING

Highway Is Built On Crest of Mountains

AN AUTOMOBILE drive has been built for 34 miles along the top of the Blue Ridge Mountains in Virginia. This roads runs across flat plateau lands at an elevation of 3,000 feet, skirts near the tops of two peaks slightly more than 4,000 feet high and tunnels the spur of a mountain. Its termini are on two state highways.

It was built by the U. S. Bureau of Public Roads to become a part of the proposed Shenandoah National Park. Grading has been practically completed, but the road will be hard surfaced only after it has had plenty of time to settle. The entire road will therefore probably not be ready for travel next summer, H. K. Bishop, chief of the Division of Construction of the Bureau of Public Roads, explained. A few miles at the northern end have, however, been opened to traffic.

Many points along the route afford views for scores of miles both to the east and to the west from the narrow top of the ridge. The Valley of Virginia and ridges of the Alleghany mountains lie to the west while the flatter Piedmont section of the state stretches eastward.

In spite of the fact that the road follows the rough crest of a mountain ridge, it was built at extremely low cost and with very easy grades and curves, accordingly to Mr. Bishop. Great care in choosing the route made this possible, he said. One may travel in safety at 45 miles an hour while from both sides of the car he views scenery more than 2,000 feet below and miles distant.

The completed 34-mile section of road is in the center of a projected 90-mile length to follow the crest of the Blue Ridge for the length of the Park.

Science News Letter, October 22, 1932

NEAR LARGE CITIES

A large portion of the country's population is near the new mountain top drive in the Blue Ridge mountains of Virginia. Washington is only about 75 miles distant by air line, Philadelphia 200, New York 280, Pittsburgh 140, Cleveland 270 and Cincinnati 320.

STANDARDS-PSYCHOLOGY

Specifications Given for Readable Auto License

LICENSE PLATES will be much more legible in future if the advice of psychologists is followed in selecting the finish, colors, and size and shape of letters.

Only 28.9 per cent. of plates are visible at the distance you would expect to read them, it was found in the course of experiments conducted in the psychological laboratory of Iowa State College under the direction of Dr. Alvhh R. Lauer.

The ideal plate should have a dull finish, Dr. Lauer concludes. Dark letters such as greens or blacks are best, and they should be printed on a light background. Bright yellow is very good for background. Difference in color is not so important, however, as difference in ability to reflect light. Numbers should be three times as high as they are wide, and the space between them should be half as wide as the number itself.

Science News Letter, October 22, 1932

GEOLOGY

Maclure on North American Geology

"A Classic of Science"

The Father of American Geology Made Some Startlingly Good Guesses About Water and Ice as Geological Agents

SOME SPECULATIVE CONJECTURES ON THE PROBABLE CHANGES THAT MAY HAVE TAKEN PLACE IN THE GEOLOGY OF THE CONTINENT OF NORTH-AMERICA EAST OF THE STONEY MOUNTAINS; by William Maclure, Esq. President of the Academy of Natural Sciences, at Philadelphia, and of the American Geological Society. Published in the American Journal of Science and Arts (Silliman), Vol. VI. New-Haven, 1823. *This is an exact reprint of the original publication.*

IN THE PRESENT state of our geological knowledge, there are, perhaps only a few facts from which we are permitted to draw conclusions respecting the former state of the earth; amongst which is our entire ignorance with regard to the origin or formation of the primitive class of rocks, we having as yet had no opportunity of observing nature in the act of aggregating or forming such rocks: the other four classes of Vulcanic (Volcanic?) Alluvial, Secondary, and Transition, we have either caught nature in the act of aggregating or forming such rocks, or rocks that from direct analogy are so similar in their construction, relative situation, &c. &c. as to warrant a deduction that they were most probably formed after this same manner.

Water appears to be the principal agent in changing the form of the earth's surface, and by the sea, lakes, and rivers, (the most extensive mode of operation;) when we see a river running between two precipices of rocks in a deep channel, whose stratification and arrangement are the same on both sides of the river, we are naturally led to suppose that the action of the running water wore down that channel, and that at some former period, the two sides of the river, now separated, were contiguous and unbroken: when we cast our eyes over immense tracts, such as the steppes in Russia, the prairies in the United States of America, or on plains that are nearly horizontal, we are tempted to conjecture that the earth took that form from the depositions from water, &c. &c. &c.

The continent of North-America, east of the Stoney Mountains consists of a ridge of primitive mountains, springing out of the great northern primitive formations, covered to the east and south-east by extensive beds of alluvial, apparently the depositions of the ocean, and on the west side overlayed by Transition and Secondary, filling the immense basin through which the Mississippi now runs with all its attendant streams.

The utmost stretch of imagination or conjecture can form no idea of any period of time, when that primitive chain of mountains called the Alleghany, did not exist; but direct analogy, and perhaps logical reasoning, authorises us to conjecture that there must have been a period, though beyond the date of our records, when neither the alluvial of the ocean, nor the Transition or Secondary depositions covered or overlaid either side of said range of mountains, and that the chain of mountains called the Alleghanies stood alone, and from the nature of the depositions which we now find covering each side, we may have a right to conjecture that it was surrounded by water; into which run all the rivers that drain said mountains, forming channels deep in proportion to the immense length of time they may have run, and consequently much more profound than the channels they afterwards wore in the level country at the foot of the mountains on the retreat of the waters; at this present time all the waters that fall into that immense basin west of the Alleghany mountains are drained off principally by the Mississippi and St. Lawrence, and a small part now by the Hudson, although it is probable that formerly a greater proportion used to pass by that channel; these then are the only rivers that break through the whole chain of the Alleghany mountains, and run into the ocean.

If on a review of any existing series of phenomena, it is permitted to form conjectures on the past, and to look back on the probable changes, that may have preceded the present state, we presume that the situation of this continent will warrant such conjectures, and we should be naturally led to suppose, that at some former period, the continuity of the great chain of mountains was unbroken, by any of the three rivers that now drain the great basin; and that the waters confined by the high surrounding ridge would form an immense lake, the surplus of which would naturally fall over the ridge into the ocean, and would in the course of time cut those passages, which would drain said lake, and leave the great interior basin, with all its secondary or deposition formation, as we now find it: as the waters that would fall over the ridge into the sea, must have previously left sediments in the lake, there would be little or no matter fit for alluvial depositions; and more probably that great alluvial formation, from the bay of Mexico to Long Island, would not have been accumulated at

WILLIAM MACLURE (1763-1840) published in 1809 the first geological map of the United States, one of the earliest ever made of any country. His speculations reprinted here antedate much of the fundamental work on geology. In this connection see Classics of Science: Agassiz, Ice Age, SNL Sep. 26, 1931; Lyell, Niagara Falls, SNL July 13 1929; Lyell, Mastodons in North America, SNL Sep. 7, 1929.

this period, and the current now called the Gulf Stream, would have then most probably run along the foot of the chain of mountains.

The continent east of the Stoney Mountains, and south of the north edge of the great lake, would then consist of an immense lake, surrounded on the east and south side by a strip of high land from one hundred to two hundred miles broad; the rain falling upon which would partly fall into the lake and partly into the ocean, through small rivers, along the mouths of which navigators might have in vain searched for rivers proportionate to the apparent extent of the continent, as they now do on the coast of New South Wales, for rivers capable of draining so extensive a country.

The passage of the St. Lawrence through the high ridge between Quebec and Montreal, must either have been torn asunder by an extraordinary convulsion, been always in that state, or it must have been worn down by the gradual but continued action of running water, aided by the friction of all the substances it carries along with it; the undisturbed regularity of all the surrounding strata both on the banks of the St. Lawrence and Hudson, renders the first supposition improbable; on the second supposition that the river had always run freely through the passage in those mountains, it must follow that the river had always run in its bed from Lake Ontario to Montreal, and from the weight of water and rapidity of its current, for so long a time, must have worn down a deep channel, and buried itself between high and perpendicular banks; but this does not correspond with the actual state of the river, which from the lake to the rising ground above Montreal runs in a bed very little below the level of the surrounding country, nor does either the present situation of the river or its banks, warrant the supposition that the action of the current had continued so long: by the same supposition the level of Lake Ontario must have always remained as far below the level of Lake Erie as at present, and the waters must have constantly fallen over the ridge at Niagara; but the small progress it has made in wearing away that ridge, compared with the effects of other rivers, (for instance, the Rhine below the lake of Constance with a tenth part of the water has worn a deeper bed ten times the distance through the high lands composed of harder materials) is against the probability of such a supposition; the small distance that the falls of Genesee river have worn its bed from the lake, with the shallow beds of the Oswego and all the other rivers that run into the lake, as well as the general nature of all the Genesee country, opposes the probability of the supposition or conjecture.

The above observations are equally applicable to the beds of the Hudson and Mohawk, before they fall over the ridge, from which it would appear that the most rational conjecture would be, to suppose the St. Lawrence wore down a passage through the high lands between Quebec and Montreal, as well as the Hudson, through the high lands above New York, and until they had affected such a cut, the whole basin on the west side of the mountains, was the bottom of an immense lake.

A similar mode of reasoning supports the conjecture that the basin of the Mississippi made part of the said lake, for the Tennessee river, while in the mountains under the name of the French Broad, has worn down its bed one hundred to two hunderd feet in solid primitive and transition rocks, but when it comes into the basin, it is obstructed in its passage, at the Muscle Shoals, by a soft secondary sandstone; the sources of the Ohio, under the name of New River, &c. &c. &c. have likewise cut deep beds in the mountains before they reach the great basin, but after their union into one great stream, the Ohio is obstructed at its falls near its mouth by a secondary limestone; from all which it would appear probable, that, had those rivers run as long through the secondary formation of the great basin, as their sources must have done to wear these beds so deep in the primitive mountains, the accumulated water of both the Ohio and Genesee would, long ere this, have worn away all the obstructing secondary rocks, and like all other great rivers that have run long in the same beds, would have been obstructed only by alluvion of their own formation. The Rappahannock, Potomac, James River, Roanoke, &c. &c. &c. that run into the Atlantic, have cut deep beds in their course through the mountains, through the level country their channels are shallow, and they all fall from twenty to thirty feet over the granite ridge into tide water, without having removed the fall half a mile from where they began, which could not have been the case had they run in the low country, as they had in the mountains.

That the branches or sources of these rivers should have run longer in the mountains than they have in the great basin or lower country; can be satisfactorily accounted for, only by supposing that they had long been wearing down these beds in the high lands before the great basin or lower country emerged from the waters, and that it has been only since the draining of those waters that their accumulated junction in the bed of the great basin under the level country began the formation of the channels they now occupy.

This conjecture may likewise account for some of the particularities in the state of the animals, originally found on this continent, such as the small number and wild condition of the wandering herds found on this part of the continent when compared with their neighbours inhabiting the elevated plains of Mexico; the great deficiency in Terrestrial Quadrupeds, compared with the vast abundance of Beavers, Otters, Muskrats, and other amphibious or aquatic animals; the great proportion of Gramnivorous and the small number of Carnivorous; the immense flocks of aquatic birds, and the very few terrestrial; might be mentioned as some of the problems solved by the foregoing supposition.

The accounting for the existence and extinction of the mammoth would not be difficult, by supposing with Mr. Peal that it was not amphibious, and though originally inhabiting the southern parts of the great lake, might in summer oc-

casionally emigrate to the north, and leave their bones on the borders; being deprived of its element by the evacuation of the great lake, might perhaps be considered as sufficient good reason for their extinction.

The large masses of granite, some of them weighing tons, scattered over the secondary between Lake Erie and the Ohio, while there is not an atom of granite in place nearer than the north side of the lake, would seem to point at the only mode by which they could probably be transported; by supposing the lake extended thus far, and that the large pieces of floating ice from the north side might carry those blocks attached to them, and drop them as the ice melted in going south; few or none being found south of the Ohio, shows that the southern sun melted the ice before it got so far.

Science News Letter, October 22, 1932

PALEONTOLOGY

Species New to Badlands Among Fossils at Princeton

MORE THAN a ton of fossils, dating as far back as eight or nine million years, were unearthed in the Big Badlands district of South Dakota by the Scott Fund Expedition, recently returned to Princeton University, Prof. Glenn L. Jepsen, director of the expedition has announced. Many of the bones represent species hitherto unknown in the Badlands.

The Titanotherium beds of Oligocene age in South Dakota and Wyoming, one of the richest fossiliferous areas in the world, were worked by the expedition. The scientists found nine skeletons, among the more important of which were those of four sabertooth tigers and a deer about the size of a dog. Other discoveries included fifty skulls.

In explanation of the variety and number of the discoveries of the expedition, Dr. Jepsen explained that one subdivision of the Oligocene fields, situated in the Big Badlands near the Black Hills in South Dakota, yields the remains of the Titanotherium, gigantic rhinocerous-like animal, and that most collecting parties operating there have searched only for the remains of this animal. Consequently, the remains of smaller animals have never previously been found, although paleontologists have known that they existed at the same time as the Titanotherium.

Science News Letter, October 22, 1932

PSYCHOLOGY

Scientist Gives Principles For Practical Propaganda

IN THE MIDST of a political campaign and with the international pot of conflicts threatening to boil over, it will be an intellectual tonic to reason about the rise of propaganda. This most subtle and modern form of social coercion matured during the World War, when the Allies "made the world safe for democracy" and "God with us" ruled Germanic emotions. Propaganda has since been worked effectively in the whipping up of mass feeling and action on everything from breakfast food to life insurance.

Like democracy, Wm. W. Biddle observes in the *Journal of Abnormal and Social Psychology*, propaganda is dependent upon widespread literacy and rapid social communication, the telephone, the press, the radio, the motion picture. Many forms of coercion create emotional disturbance in the coerced, resentments, over-compensations, or desires for revolt. Propaganda is different in that it controls without occasioning antagonistic emotions. Each individual behaves as though his response were his own decision. Many individuals may be coerced to behave alike, each apparently guided by his independent judgment.

Education has as one of its major interests the development of rational or conscious control over conduct. Instead of acting instructively or according to habit, the truly educated person takes time to consider the problem.

The aim of propaganda is to prevent thinking and promote emotion. It uses emotionally toned phrases which provoke impulsive action and are repeatable. Propaganda as practiced today is a process of indirect emotional conditioning on a large scale.

For practical propaganda, Dr. Knight Dunlap, Johns Hopkins professor of psychology, gives a list of principles:

(a) Repeat systematically and incessantly.

(b) Avoid argument, never admit there is another side; reserve argument for intellectuals.

(c) Connect the desired idea with the known wishes of the audience.

(d) Make statements in clear repeatable form.

(e) Use direct statements sparingly; use indirection, inuendo, implication. Use direct statement in such a way that the audience will take it in but not reflect upon it.

(f) For permanent results, aim propaganda at the children.

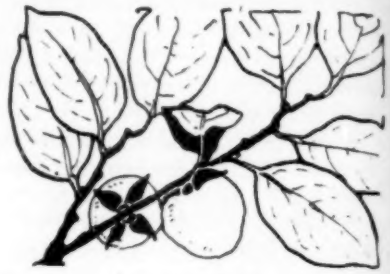
They are repeated here in the hope that they will be useful in defending the helpless everyday mortal from the menace of propaganda.

Science News Letter, October 22, 1932

Because so many fabrics now on the market, such as rough crepes and knit goods, are very elastic, the silk industry has had considerable controversy as to the proper method of determining yardage, and special equipment has been devised to meet the situation.

BOTANY

NATURE RAMBLINGS *by Frank Thone*



'Simmons

ALL ALONG the edge of Dixie, and up into the North so far as that noble tree will deign to grow, juvenile mouths have been watering for weeks, waiting for the frost to take the pucker out of the persimmon. There is only a moderate amount of pulp around the big, slippery seeds, but quality makes up for lack of quantity, and on a lazy autumn day there's plenty of time to gather 'simmons, anyway.

The possibilities of the American persimmon as a contribution to the world's fruit basket have had to wait for the coming of a foreign brother to be appreciated. Some years ago the Japanese persimmon, a huge fruit, big as a baseball but very well flavored, was introduced in the South. Its shipping and keeping qualities are only moderate, so that no more than a trickle of shipments has come through to the markets of the North. Yet it has met approval, and now efforts are being put forth to make a match between this rather delicate exotic tree and our sturdier native. It is to be hoped they will succeed.

For one thing beyond its fruit is the persimmon highly valued. Those most knowing of all workers in wood, the makers of golf clubs, prize its hard, heavy, even-grained timber very highly. The persimmon has a good ancestral claim to such quality, for it is the northernmost representative of the aristocratic clan of trees that includes the lordly mahogany.

Science News Letter, October 22, 1932

Just nineteen years ago in an air race, the prize was won by a plane traveling 45 miles an hour; now, in the same contest, 407 miles sets a record.

• First Glances at New Books

Additional Reviews On Page 268

Evolution

THE CAUSES OF EVOLUTION—J. B. S. Haldane—*Harper,* 235 p., $2.50. Haldane is better able to speak as one having authority on certain subjects, like natural selection, than most biologists, because he is one of the fortunate few among biologists who know enough mathematics to bring a statistical attack to bear on these problems. He develops his point of view in the body of his text with a minimum of mathematics, however, and judiciously holds his heavy fire for an appendix, where they may go who are able to follow him.

Science News Letter, October 22, 1932

Evolution

THE SCIENTIFIC BASIS OF EVOLUTION—T. H. Morgan—*Norton,* 286 p., $3.50. As might be expected, Prof. Morgan presents a great deal of material from the side of genetics, much of it quite recent either in basic data or in method of approach. For this reason alone the book would be well worth the reading. He also devotes chapters to the social evolution of man, and to the still-vext question of the metaphysical *versus* the mechanistic standpoint in evolution and in biology in general.

Science News Letter, October 22, 1932

Geometry

PROJECTIVE DIFFERENTIAL GEOMETRY OF CURVES AND SURFACES—Ernest Preston Lane—*Univ. of Chicago Press,* 321 p., $4. The second book in English on projective differential geometry which was founded as a science at the University of Chicago by Prof. E. J. Wilczynski, who published in English the first book on the subject in 1906. In the intervening period this branch of mathematics has been expanded in four countries and described in as many languages. The book contains material hitherto unpublished. It will interest students of mathematics only.

Science News Letter, October 22, 1932

Biology

PROBLEMS OF RELATIVE GROWTH—Julian S. Huxley—*Mac Veagh,* 276 p., $3.50. Mr. Huxley is one of the foremost exponents of the application of quantitative and statistical methods to the problems of growth and related physiological phenomena. In this book he has gathered results of his own researches which have hitherto been widely scattered in the literature, and has thus been able to add the advantage of correlation and inter-comparison. All physiologists will want this book in their libraries.

Science News Letter, October 22, 1932

Biology

PROBLEMS IN BIOLOGY—G. W. Hunter—*American Book Co.,* 706 p., $1.76. The newest text by one of the best known of American producers of school books in science. Dr. Hunter brings to the task of text-book writing not only a long experience as a teacher of elementary biology, but a most thorough understanding of what is needed for projecting the lessons through a book, which is an entirely separate ability, and much rarer to find.

Science News Letter, October 22, 1932

Zoology

AT THE ZOO AND AT HOME—J. L. McCreery—*Stokes,* 160 p., $1.75. A book about animals for readers of about high school age. It contains plenty of information, straightforwardly presented; but its chief charm is to be found in the superbly executed black-and-white illustrations which fill up nearly half its pages.

Science News Letter, October 22, 1932

Aeronautics

THE STORY OF THE AIRSHIP—Hugh Allen—*Goodyear Tire and Rubber Co.,* 96 p., 50c. The eighth annual edition of a manual of popular information about lighter-than-air craft, issued by the world's principal constructors of airships.

Science News Letter, October 22, 1932

Biology

A SURVEY COURSE IN GENERAL BIOLOGY—J. G. Needham—*Comstock,* 376 p., $2.70. Prof. Needham offers here a "boiled-down" textbook for use in a short course in general biology; he has succeeded in reducing the book far below the bulk to which one is accustomed in texts of this kind, yet without sacrificing any essentials.

Science News Letter, October 22, 1932

Zoology

MANUAL OF ANIMAL BIOLOGY—G. A. Baitsell—*Macmillan,* 382 p., $2.50. A clean-cut textbook of zoology, developed on the type-animal system, with laboratory directions bound in the same cover. The full-page illustrations by Richard E. Harrison are much more "alive" than most text-book pictures.

Science News Letter, October 22, 1932

Nature Study

OUT OF DOORS—Paul B. Mann and George T. Hastings—*Holt,* 448 p., $1.60. Subtitled "A Guide to Nature," this book for high school students and young people in summer camps comes up to its profession admirably. It devotes most of its space to plants and animals, but also has good sections on geology and astronomy, as well as on organization for the study of nature.

Science News Letter, October 22, 1932

General Science

POPULAR SCIENCE TALKS—Edited by Ivor Griffith—*Philadelphia College of Pharmacy and Science,* 319 p., $1. The ninth volume of a series, in which the popular lectures given at the Philadelphia College of Pharmacy and Science are each year offered to the public in printed form.

Science News Letter, October 22, 1932

Zoology

THE INVERTEBRATA—L. A. Borradaile and others—*Macmillan,* 645 p., $5.50. A complete and thorough-going textbook of invertebrate zoology, written by four leading English zoologists. There is probably no book of its size now in print that excels it as a discussion of the internal anatomy of invertebrate animals. The line illustrations are excellent.

Science News Letter, October 22, 1932

Physics

DIRECTED STUDIES FOR THE PHYSICS LABORATORY—B. L. Cushing—*Ginn,* 168 p., 76c. An intelligently worked out notebook for physics courses in secondary schools. A useful feature is the short list of questions, appended after each section, introducing everyday encounters with physics.

Science News Letter, October 22, 1932

General Science

A GENERAL SCIENCE WORKBOOK—C. H. Lake, L. E. Welton and J. C. Adell—*Silver, Burdett,* 29 p., 60c. Questions and problems for the students are contained in one book; answers for the guidance of the teacher in another.

Science News Letter, October 22, 1932

Chemistry

A SHORT COURSE IN QUALITATIVE ANALYSIS—F. E. Brown—*Century,* 332 p., $2.25. A good text for students who are preparing for advanced work in chemistry.

Science News Letter, October 22, 1932

• First Glances at New Books

Additional Reviews On Page 269

Sociology

PLANT SOCIOLOGY—J. Braun-Blanquet, transl. by George D. Fuller and Henry S. Conrad—*McGraw-Hill,* xviii +439 p., $4.50. Plant Sociology has long been a most attractive name for a botanical idea hitherto but vaguely realized. As a definite discipline, it has developed more rapidly in Europe, and particularly in Switzerland, than it has in this country. In Braun-Blanquet's *Pflanzensoziologie* the best doctrines and methods evolved to date have been crystalized, and a translation of this work forms the basis of the present publication. It has been revised by the addition of newly developed material and also by the inclusion of data from American sources, so that it will be thoroughly useable on this continent as well as in Europe. It forms a most admirable companion volume to Weaver and Clements' *Plant Ecology.*

Science News Letter, October 22, 1932

Engineering-Architecture

HOUSING AND THE COMMUNITY: HOME REPAIR AND REMODELING—*President's Conference on Home Building and Home Ownership,* 291 p., $1.15. Volume VIII of the final reports of the Hoover conference on the home. The section on modernizing of existing houses will interest many, while the discussions of the effect of housing on community life is valuable data for those who desire to improve their cities or villages.

Science News Letter, October 22, 1932

Chemistry

RECENT ADVANCES IN PHYSICAL CHEMISTRY—Samuel Glasstone—*Blakiston,* 470 p., $3.50. To bridge the gap between the ordinary textbooks on physical chemistry and the extensive journal literature reporting new developments, this book has been prepared by the lecturer in physical chemistry at the University of Sheffield. It will appeal to chemists in active practice and to advance students desirous of following discoveries of the past decade in physical chemistry.

Science News Letter, October 22, 1932

Engineering

WEIGHTS, MEASURES AND DECIMAL TABLES—*Sir Guilford Molesworth—Spon and Chamberlain,* 118 p., $1. This is a tiny book, literally vest-pocket size, but it contains tables that will be a great comfort to engineers, physicists and quantitative workers in general. It not only gives such conversions as one would conventionally expect, such as miles to feet, or cubic feet to gallons, but such information as the equivalence of sums in the present British coinage to those in the proposed new decimal system, and the decimal equivalents of the days in a year.

Science News Letter, October 22, 1932

Chemistry

ANNUAL SURVEY OF AMERICAN CHEMISTRY—Edited by Clarence J. West, Director, Research Information Service, National Research Council—*Chemical Catalog Co,* 573 p., $4.50. This important survey is now an institution in American chemical literature. Leading American chemists in thirty-seven fields summarize the progress that has been made in America. The ample indices make the book easily and practically useful. This is the sixth annual survey prepared under the direction of the National Research Council.

Science News Letter, October 22, 1932

Chemistry

FUNDAMENTALS OF PHYSICAL CHEMISTRY—Earl C. H. Davies—*Blakiston,* 370 p., $2.75. A text by the Professor of Physical Chemistry at West Virginia University. The earlier chapters deal with those subjects most urgently needed to understand the laboratory work of physical chemistry and in analytical chemistry. Numerous references to recent literature are included, and these will give the student a better perspective of the growing field of physical chemistry.

Science News Letter, October 22, 1932

Public Health

EPIDEMIOLOGY, HISTORICAL AND EXPERIMENTAL — Major Greenwood—*Johns Hopkins Press,* 80 p., $1.50. This volume contains the three Herter Lectures for 1931, the first one having been expanded by one-fourth. The book is somewhat technical but will give the careful reader a good idea of the methods of modern and ancient epidemiology. The specialist in the field will, of course, find it valuable.

Science News Letter, October 22, 1932

Mathematics-History of Science

SCRIPTA MATHEMATICA—Edited by Jekuthiel Ginsburg—*Yeshiva College (New York),* Quarterly, $3 a year. This new journal, devoted to the history of mathematics, promises to be of interest to a wide field of readers far transcending the boundaries of professional mathematics. Among the articles in this first number is one on Thomas Jefferson's interest in mathematics, a facsimile of a hitherto unpublished Jefferson letter, recollections of Einstein's boyhood and an account of the ancient Peruvian quipu.

Science News Letter, October 22, 1932

Fiction

DISTANT WORLDS—Friedrich Mader—*Scribner,* 342 p., $2. Fiction with the prophetic "scientific" background that Jules Verne made famous. It is translated from the German.

Science News Letter, October 22, 1932

Physics-General Science

TEMPERATURE AND HUMIDITY MEASUREMENT AND CONTROL—M. F. Behar—*Instruments Pub. Co.,* 320 p., $4. To those concerned with regulation of heat and moisture content in industry this handbook is a valuable publication. It binds in one volume parts two and three of a manual of instrumentation. It covers industrial thermometry, pyrometry, temperature control and humidity measurement and control.

Science News Letter, October 22, 1932

Chemistry

TESTING PRECIOUS METALS WITH THE TOUCHSTONE—C. M. Hoke—*Jewelers' Technical Advice Co.,* 28p. 50c. Methods of telling without assaying how much gold, platinum, and palladium are contained in precious alloys.

Science News Letter, October 22, 1932

Chemistry

CHEMISTRY AND CHEMICAL ENGINEERING—Walter J. Greenleaf—*Govt. Print. Off.,* 14 p., 5c. This is guidance leaflet 19 of the U. S. Office of Education devoted to a description of career opportunities in the field of chemistry.

Science News Letter, October 22, 1932